Infosystems

The Information Systems Magazine for Management

CU590-3

Software Protection: The Data Cookie Jar

Fiber Optics Opens a New World of Communications

Facsimile Courts Other Technologies

Stay-at-Home Conference Is More than Just an Energy Saver

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SOFTWARE INFO
2nd Annual National Software Package Conference and Exposition Chicago
Sept. 14-17, 1981

Infosystems

The Information Systems Magazine for Management

August Volume 28 Number 8

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Cover

Art Director Len Schimek uses a disk pack made out of cookies and the cookie jar as a means of symbolizing the temptation some people may have to grab a few morsels from the computer data base for illicit purposes or gains. Our lead article in the Software Info section presents some ideas on how to protect that data. Photography by Bud Marcom.

Coming in September

A staff report will examine the variety of available software packages and role they play in increasing productivity. The editors will also look at the growing selection in terminals, microcomputers and word processing systems.

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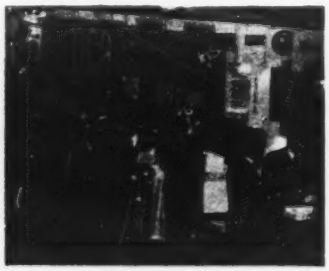

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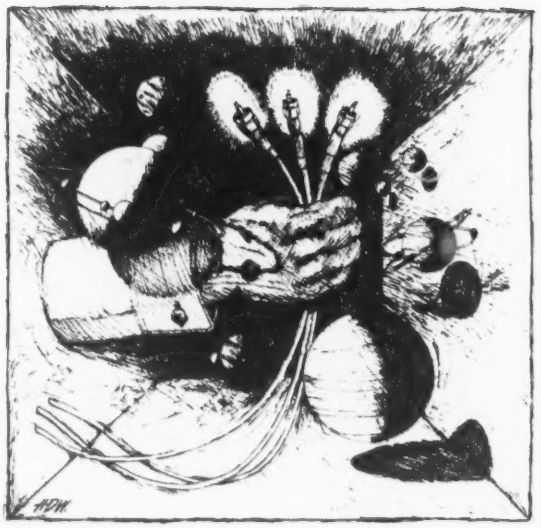
Fiber Optics

A New World of Communications



No longer a blue-sky experiment confined to the lab, fiber optics are proving to be a practical, easy-to-handle means of communicating more data at faster rates and with complete integrity.

by Alan G. Rockhold
Senior Editor

Fiber optics is a technology that is just now beginning to come into its own. While the average "man on the street" still knows little or nothing about it—with the exception, perhaps, of one of those intriguing lamps in his teenager's room—the technology is no longer a laboratory curiosity but a viable, applied technology expected to generate nearly two billion dollars in the US alone by 1990.

The boom is coming sooner and faster than many expected. In a recent article, *Business Week* pointed out that the Bell Systems plan to spend $80 million on fiber optics systems this year and $140 million in 1982. "Projections from US phone-company purchases alone," says *Business Week*, "have been boosted from $450 million to $750 million annually by 1990."

North of the border, Bell Canada has been conducting an experiment with fiber optics since March. The company's Computer Communications Group (CCG), Canada's largest telecommunications organization, selected two Canadian computer service companies, Datacrown Inc. and Canada Systems Group (CSG), that have the sophisticated computer communications environment required for a full-scale fiber optics field trial.

CCG has installed a 12-fiber cable in underground cable ducts connecting CSG's headquarters with the nearest Dataroute network switching office (3.4 Km away). It has also installed a second 12-fiber cable connecting Datacrown with the Dataroute office nearest *its* headquarters (2.6 Km away). Since March, the two companies have been sending a portion of their normal high-speed digital data traffic over these fiber optic strands. The experiment ends in September, and CCG will be evaluating the performance of the fiber optic circuits and comparing it with that of conventional copper cables.

Says Dave Durnford, CCG's Toronto and Western Ontario manager, "This is the first time in the world that fiber optics have been used from the customer location to the telephone network for a high-speed data processing application." One of the many advantages cited by Durnford is that "we can combine voice, video and data on the same fiber optic link." Adds Datacrown president Dick Taylor, "We're really excited about fiber optics as a possible way by which we can improve the cost of communications to our clients and make our service much more reliable to them."

What are some of the other advantages of fiber optics? Ed M. Sakaguchi, director of market development for fiber optics at the Amphenol North America Division of Bunker Ramo Corp., Oak Brook, IL, lists several:

- **No electrical current.** Fiber optics is the transmission of light, or optical signals, not electrical current or voltage. The absence of a potential spark makes fiber optics particularly well-suited for industrial process controls in explosive environments such as grain elevators, petrochemical operations, distilleries and refineries.
- **No EMI or RFI.** Unlike electrical signals transmitted over copper wire, optical signals are impervious to electromagnetic interference (EMI) and radio frequency interference (RFI); similarly, they do not generate EMI/RFI. This characteristic is advantageous to users in the data transmission industry, where induced fields may generate erroneous data or cause serious systems malfunctions. Optical links between peripherals, microprocessor and mainframe, or within terminals, can eliminate these problems.
- **Secure communications.** Absence of EMI/RFI characteristics gives fiber optics unmatched data transmission security. Since generation of electromagnetic fields is the basis for remote "bugging" or homing in, this technique is useless on fiber optic lines. The only way to steal information would be to physically tap into the light-carrying fiber, and this would immediately produce a noticeable light/signal loss.
- **Lightweight and compact.** This is a key attraction for the telecommunications industry. An optical cable of 144 fibers can carry 96,768 two-way phone conversations and yet be only an inch in diameter and weigh less than six ounces per foot. A comparable copper coaxial cable would probably be three inches in diameter and weigh 10 pounds per foot. In crowded urban areas where cable conduits may already be filled to capacity and excavation for additional conduit systems would be extremely expensive or practically impossible, telephone crews need only pull out existing copper cable.
- **High data rate capability.** In addition to being smaller and lighter, optical fibers have far greater information-carrying capacity than their

... continued on page 58

copper cable counterparts. For example, phone companies can now combine 24 two-way conversations for transmission on two pairs of copper wires (one pair for each direction). With fiber optics, they can combine 672 two-way conversations on one fiber pair, each fiber being literally as thin as human hair.

Although the phone companies, the government and the military are the largest consumers of fiber optics technology, there are plenty of other, smaller concerns moving toward optical fibers and away from copper cables. For example, Canoga Data Systems of Canoga Park, CA, lists a hospital and a computer mainframe manufacturer among its recent clients. In the case of the hospital, a new facility with 60 to 70 terminals scattered throughout a five-story building—at nursing stations, in the kitchen, in the pharmacy—needed to link up with a nearby medical computing center serving several other hospitals. According to a spokesman for Canoga, the new facility was just about ready to order 96 short-haul modems and to pull two cables with 64 twisted pairs each through a steam tunnel to the computing facility about two blocks away. Instead, they opted for a 2,000-ft.-long, 12-fiber cable. At its destination in the computer center, the cable goes into five stacked multiplexers. At the hospital end, the cable splits into six two-fiber lines, and there's a multiplexer on each floor with optical interface channels. Although the hospital spent more for the fiber optic lines than it would have for copper wire, it saved in other ways; it took a day to install the fiber cable where it would have taken a week to pull copper, and the user was able to multiplex economically, something it could not have done with the twisted-pair cables.

In another instance, a large computer mainframe maker moved its software personnel from its computer center to a building across the street. By using fiber optic technology, the user was able to multiplex 150 terminals onto just two fibers of a six-fiber cable. In addition, the line is carrying four 56K bps channels between a small auxiliary computer in the software development center and a large mainframe in the main computer center. Canoga Data Systems says that this decision to go with fiber optics will pay for itself in about a year. The client paid about $36,000 for its new system, but is now saving more than $2,600 a month in payments to the telephone company.

Valtec Corp. of West Boylston, MA, another supplier of fiber optics technology, has also contracted work with a wide variety of clients. These include:

- A cablevision company in Ohio has installed a two-mile fiber optic link between its satellite receiving terminal and its local distribution center. The 10-fiber cable is used to relay 10 channels of satellite-delivered TV programming to seven different communities.
- A manufacturer of custom aerial devices for phone and power utilities used fiber optics to solve a very serious problem: the danger of electrocution of workers whose aerial devices come into contact with high-voltage lines. Using fiber optic cable, the manufacturer designed a device that accepts signals from the operator, converts them into digital light pulses, transmits them to a receiver that converts them back into analog electrical signals, and then relays the commands to solid-state drivers which activate the aerial device.
- A California firm that manufactures microcomputer-based boiler control systems uses fiber optic cable to provide an interference-free communications link between the flue gas analyzer and the control console. The analyzer, anywhere from 100 to 500 feet away from the CRT and control panel, measures such things as carbon monoxide and unburned hydrocarbons. This information is converted to light pulses and fed over the fiber optic line to the computer, where continual adjustments can be made.

These examples point up an important consideration: it's not just the capacity and speed of transmission that are the criteria for selecting fiber optics technology; sometimes these are not criteria at all. The actual *characteristics* of the fibers—and, by comparison, the characteristics of copper wire—are equally important. A manufacturer, for example, may need to run 96 asynchronous channels from one end of his plant to the other. For his purposes, a 1,200-bps rate may be ample; his concern is the noise, ground loops and electromagnetic interference so common in industrial plants. Such disturbances can corrupt digital information and produce an unacceptably high bit error rate (BER). By switching to fiber optics, he can completely eliminate this problem. And, by multiplexing 96 low-speed channels onto six high-speed optical fibers, he can actually transmit at a lower cost than he could with wire.

In order to determine whether such an application would be feasible, a user must ask himself a few basic questions. Sakaguchi of Bunker Ramo lists the key questions: 1) what is to be transmitted; 2) how far is the information to be transmitted; and 3) at what speed will it be transmitted?

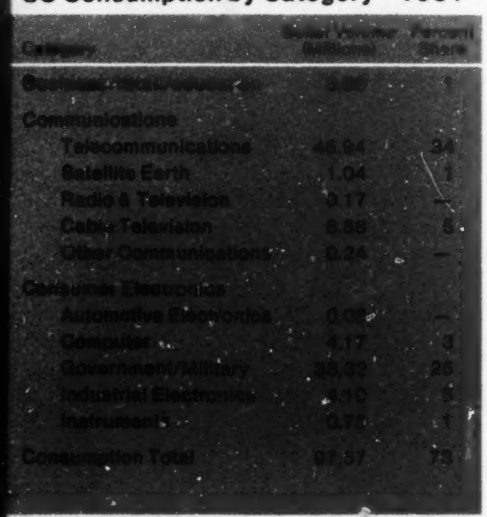
. . . *continued on page 61*

Clear As Sand

Bell Canada provides some interesting facts about fiber optics:

- They are made mostly of silica or sand—one of the most abundant materials on earth. Copper, on the other hand, is a finite resource that is gradually being depleted.
- The fibers used in fiber optic cables are six one-thousandths of an inch thick.
- Fibers made of glass are so pure that if you looked through a window of the material one kilometer thick, it would appear as transparent as a pane of glass. If the water of the Pacific Ocean were as clear, you could see bottom at the deepest point.
- Fiber has the same tensile strength as steel wire of the same diameter.
- Fibers are flexible. You can bend a fiber optic strand into a circle one-quarter of an inch thick in diameter and it won't snap.
- Fibers conserve energy. A telephone system using glass would use about one-third the electricity required by today's networks. □

Fiber Optic Components: US Consumption by Category—1981



Source: Gnostic Concepts Inc.

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Fiber optics . . . *continued*

Other considerations include the range of temperatures to which the cable would be exposed and the presence of moisture, altitude, vibration, corrosive or explosive atmospheres, and physical shock. These measurements will help determine what type of fiber is required—glass, plastic, or plastic-coated glass—as well as what kinds of jacketings and protective coatings are needed.

Another consideration, of course, is cost. Currently, fiber optic cable costs more than copper wire, but this situation is changing. Bill Walsh, an analyst with Gnostic Concepts Inc. of Menlo Park, CA, a market research firm, says, "As demand increases, production is going to go up and there will be economies of scale. Between 1981 and 1985, we expect a 17 percent average annual drop in the price of fiber optic cable."

And not a minute too soon. Gnostic Concepts is predicting a growth rate of 43 percent per year between now and 1985, and a 23 percent annual growth rate between 1986 and 1990. The company expects the total fiber optic market to reach $1.87 billion by 1990. The accompanying chart shows the breakout, by dollar volume and percent share, of fiber optic consumption in 1981.

The categories shown on the chart account for only 73 percent of the total; the balance comes from a category that Walsh calls "Adjustments." These include such things as trade balance, inventory change, research and development and other nonproduction uses. This segment of the market should account for approximately $36.91 million (the remaining 27 percent) in 1981. Taken together, the two segments will generate a US market this year of $134.5 million.

As Bill Boggs, president of Canada Systems Group, sums it up: "In the longer term, I think the enhanced capability of fiber optics that comes through the use of a laser beam and the glass fiber will not only allow us to use today's computer technology better, but will put us in a position to handle the much more powerful computers that we'll have installed in the next two or three years in this industry." □

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